A-94-09
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Summary and Analysis of Comments on the California Federal Implementation Plan: Medium-duty Vehicles

Introduction

EPA proposed and received comment on requirements for medium-duty vehicles in the California Federal Implementation Plan (FIP). The preamble for the FIP final rule provides a detailed summary and analysis of comments where the comments were relevant to the changes between the proposal and the final rule. This document includes an analysis related to comments regarding the stringency of the proposed medium-duty vehicle standards.

In the FIP proposal, EPA proposed a two-year phase-in of standards such that all 2000 and later model year MDVs should comply with standards that were based on the California Air Resources Board's (CARB's) ultra low-emission vehicle (ULEV) standards for MDVs. EPA noted that it believed the proposed standards were similar in stringency to the light-duty low-emission vehicle (LEV) standards. In their comments on the FIP proposal, vehicle manufacturers claimed that the current CARB MDV requirements (which require most MDVs to comply with LEV standards and only a small fraction of MDVs to comply with the ULEV standards) were already similar in stringency to the light-duty provisions.

In response to manufacturers' comments on the stringency of the standards, EPA has performed a technical analysis of CARB's low-emission vehicle program standards. In specific, EPA has compared the stringency of CARB's MDV standards to the stringency of the heavier light-duty truck (LDT) standards (i.e., trucks with a gross vehicle weight rating of 3,751 to 5,750 pounds) taking into account the effect of fuel consumption and vehicle weight on NMOG and NOx emissions.

CARB's Low-emission Vehicle Program Standards

Table MDV-1 contains the 50,000 mile NMOG and NOx standards established by CARB in their low-emission vehicle program for light-duty vehicles (LDVs), LDTs and MDVs.

Table MDV-1

	LDV & LDT (<3750 lbs) stds	LDT (3751-5750 lbs) stds	MDV Standards				
			0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000 14000 lbs
Tier 1							
NMOG	0.25	0.32	0.25	0.32	0.39	0.46	0.6
NOx	0.4	1.0	0.4	0.7	1.1	1.3	2.0
Transitional Low-emission Vehicle (TLEV)							
NMOG	0.125	0.16	-	-	-	-	-
NOx	0.4	0.7	-	-	-	-	-
Low-emission Vehicle (LEV)							
NMOG	0.075	0.1	0.125	0.16	0.195	0.23	0.3
NOx	0.2	0.4	0.4	0.7	1.1	1.3	2.0
Ultra Low-emission Vehicle (ULEV)							
NMOG	0.04	0.05	0.075	0.1	0.117	0.138	0.18
NOx	0.2	0.4	0.2	0.4	0.6	0.7	1.0

For LDVs and LDTs, manufacturers must comply with a sales-weighted fleet average NMOG emissions level that declines over time. As long as manufacturers comply with the fleet average (and a zero emission vehicle sales percent requirement), they may certify any combination of TLEVs, LEVs and ULEVs. However, the light-duty program is based on the assumption of full compliance with the LEV (or tighter) standards beginning in 2000. For MDVs, a manufacturer must comply with specified sales percent requirements for LEVs and ULEVs. For 2001 and later under CARB's program, 85 percent of MDVs are required to meet the LEV standards and the remaining 15 percent are required to meet the ULEV standards.

Stringency Comparison of the NMOG Standards

The amount of exhaust hydrocarbon emitted by a vehicle is proportional to the fuel consumption of the vehicle. Fuel consumption, in turn, is proportional to the weight of a vehicle. CARB has examined the impact of vehicle weight on the relative fuel

consumption of light-duty and medium-duty vehicles.[1] Relying on the CARB information, EPA estimated the relative fuel consumption of LDTs and MDVs compared to a LDV with a weight of 3,750 pounds. Table MDV-2 contains the relative fuel consumption of LDTs and MDVs (using the upper end of the weight range in each MDV subcategory) compared to a 3,750 pound LDV. Table MDV-2 also presents the relative fuel consumption of MDVs compared to a 5,750 pound LDT.

Table MDV-2

Vehicle Category	Test Weight (pounds)	Relative Fuel Consumption as Compared to:	
		3750 pound LDV	5750 pound LDT
LDT	5750	1.5	1.0
MDV	3750	1.2	0.8
	5750	1.5	1.0
	8500	1.9	1.27
	10000	2.1	1.36
	14000	2.7	1.73

Based on the relative fuel consumption values for MDVs compared to a 5,750 pound LDT, EPA projected MDV emission levels that would be equivalent in stringency to the LEV and ULEV standards adopted by CARB for heavier LDTs. The projected MDV levels, contained in Table MDV-3, were calculated by multiplying the LDT standards by the relative fuel consumption numbers for MDVs (compared to the 5,750 pound LDT) contained in Table MDV-2.

[1] "A Study of Excess Motor Vehicle Emissions - Causes and Control," CARB, October 1989.

Table MDV-3

Vehicle Type	CARB LDT NMOG std	Projected MDV NMOG Levels Equivalent to the LDT (3,751 to 5,750 pounds) NMOG Standards				
		0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000-14000 lbs
LEV	0.10	0.08	0.10	0.127	0.136	0.173
ULEV	0.05	0.04	0.05	0.064	0.068	0.086

Next, EPA compared the projected LEV and ULEV levels for MDVs (from Table MDV-3) to the comparable MDV standards required under CARB's low-emission vehicle program (from Table MDV-1). Table MDV-4 contains the ratio of the projected MDV levels to the actual MDV standards. A value of 1.0 would mean that the projected level is equal to the actual standard and, therefore, the actual standard would be equivalent in stringency to the heavier LDT standard. It should be noted that all of the ratios are well below 1.0, which means that the projected MDV levels (which are equivalent in stringency to CARB's heavier LDT standards) are lower than CARB's actual MDV standards. Therefore, CARB's actual LEV and ULEV NMOG standards for MDVs appear to be significantly less stringent than CARB's comparable heavier LDT standards.

Table MDV-4

Vehicle Type	Ratio of Projected MDV NMOG Levels to CARB's Actual MDV NMOG Standards				
	0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000-14000 lbs
LEV	0.64	0.62	0.65	0.59	0.58
ULEV	0.53	0.50	0.54	0.49	0.48

EPA then compared the projected LEV levels for MDVs (from Table MDV-3) to CARB's actual ULEV standards for MDVs (from Table MDV-1). Table MDV-5 contains the ratio of the projected MDV levels to CARB's actual ULEV standards for MDVs. It should be noted that in all cases, the ratio is approximately 1.0, which means that the projected LEV levels for MDVs (which are equivalent in stringency to CARB's LEV standard for heavier LDTs) are approximately the same as CARB's actual ULEV standards for MDVs. Therefore, CARB's actual

ULEV NMOG standards for MDVs are roughly equivalent in stringency to CARB's LEV NMOG standard for heavier LDTs.

Table MDV-5

Ratio of Projected MDV LEV NMOG Levels to CARB's Actual MDV ULEV NMOG Standard				
0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000-14000 lbs
1.0	1.0	1.09	0.99	0.96

Stringency Comparison of the NOx Standards

The amount of exhaust NOx emitted by a vehicle is proportional to the amount of loading to which the vehicle is subjected. CARB developed an emissions model, called the VEHSIME model, that estimates the impact of vehicle weight on NOx emissions.[2] Using the VEHSIME model, EPA estimated the relative NOx emissions for MDVs (using the upper end of the weight range in each MDV subcategory) compared to a LDT with a weight of 5,750 pounds. Table MDV-6 contains the relative NOx emissions of MDVs compared to a 5,750 pound LDT.

Table MDV-6

Vehicle Category	Test Weight (pounds)	Relative NOx Emissions Compared to a 5750 pound LDT
LDT	5750	1.00
MDV	3750	0.57
	5750	1.00
	8500	1.59
	10000	1.92
	14000	2.78

Based on the relative NOx emission rates for MDVs compared to a 5,750 pound LDT, EPA projected the MDV emission levels that would

[2] "A Study of Excess Motor Vehicle Emissions - Causes and Control," CARB, October 1989.

be equivalent in stringency to the heavier LDT NOx standard adopted by CARB. (CARB adopted the same NOx standard for heavier LDT LEVs and ULEVs.) The projected levels, contained in Table MDV-7, were calculated by multiplying the heavier LDT standard of 0.40 grams per mile by the relative NOx emission rates (compared to the 5,750 pound LDT) contained in Table MDV-6.

Table MDV-7

Vehicle Type	CARB LDT NOx std	Projected MDV NOx Levels Equivalent to the LDT (3,751 to 5,750 pounds) NOx Standards				
		0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000-14000 lbs
LEV/ ULEV	0.40	0.23	0.40	0.64	0.77	1.11

Next, EPA compared the projected LEV and ULEV levels for MDVs (from Table MDV-7) to the comparable MDV standards required under CARB's low-emission vehicle program (from Table MDV-1). Table MDV-8 contains the ratio of the projected MDV levels to the actual MDV standards. As noted earlier in the discussion of the NMOG standards, a value of 1.0 would mean that the projected level is equal to the actual standard and, therefore, the actual standard would be equivalent in stringency to the heavier LDT standards. As the results show, all of the ratios for the LEV comparison are well below 1.0, which means that the projected LEV levels for MDVs (which are equivalent in stringency to CARB's heavier LDT standard) are lower than CARB's actual LEV standards for MDVs. Therefore, CARB's actual LEV NOx standards for MDVs appear to be significantly less stringent than CARB's LEV NOx standard for heavier LDTs. However, the ratio is approximately 1.0 for the ULEV comparison, which means that the projected ULEV levels for MDVs (which are equivalent in stringency to CARB's LEV standard for heavier LDTs) are approximately the same as CARB's actual ULEV standards for MDVs. Therefore, CARB's actual ULEV NOx standards for MDVs are roughly equivalent in stringency to CARB's LEV NOx standard for heavier LDTs.

Table MDV-8

Vehicle Type	Ratio of Projected MDV NOx Levels to CARB's Actual MDV NOx Standards				
	0-3750 lbs	3751-5750 lbs	5751-8500 lbs	8501-10000 lbs	10000-14000 lbs
LEV	0.58	0.57	0.58	0.59	0.56
ULEV	1.15	1.00	1.06	1.10	1.11